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Ephemeris for Physical Observations of the Moon, 1897 *January to August.* By A. Marth.

Greenwich Noon.		Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Direction.
1897.		°	°	°	°	°	°
Jan.	7	317·12	−0·75	+5·07	−2·74	5·76	241·6
	8	329·30	·73	4·26	4·00	5·84	226·7
	9	341·47	·71	3·22	5·06	6·00	212·4
	10	353·63	·69	2·03	5·88	6·22	198·9
	11	5·79	·66	+0·75	6·44	6·48	186·6
	12	17·94	·64	−0·53	6·73	6·75	175·5
	13	30·09	−0·61	−1·73	−6·72	6·94	165·6
	14	42·23	·58	2·80	6·42	7·00	156·5
	15	54·37	·55	3·69	5·83	6·89	147·8
	16	66·50	·52	4·34	4·95	6·58	138·8
	17	78·63	·49	4·75	3·80	6·08	128·7
	18	90·76	·46	4·91	2·43	5·48	116·4
	19	102·89	−0·43	−4·81	−0·90	4·89	100·6
	20	115·02	·40	4·48	+0·70	4·54	81·1
	21	127·15	·37	3·95	2·29	4·56	59·8
	22	139·29	·34	3·23	3·77	4·96	40·6
	23	151·43	·31	2·37	5·03	5·56	25·2
	24	163·58	·28	1·41	5·99	6·15	13·2
	25	175·73	−0·25	−0·38	+6·60	6·61	3·3
Feb.	6	321·95	+0·06	+2·02	−5·69	6·04	199·5
	7	334·13	·09	+0·86	6·34	6·40	187·7
	8	346·30	·11	−0·40	6·71	6·72	176·6
	9	358·47	·14	1·67	6·80	7·00	166·3
	10	10·64	·17	2·89	6·59	7·19	156·5
	11	22·80	·20	3·98	6·09	7·27	147·0
	12	34·95	+0·23	−4·87	−5·31	7·20	137·6
	13	47·10	·26	5·50	4·26	6·95	127·8
	14	59·24	·29	5·82	2·97	6·53	117·1
	15	71·38	·32	5·80	−1·48	5·98	104·4
	16	83·52	·35	5·42	+0·12	5·42	88·7
	17	95·65	·39	4·70	1·77	5·02	69·3
	18	107·79	+0·42	−3·70	+3·32	4·96	48·0
	19	119·93	·45	2·45	4·67	5·29	27·6

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Greenwich Noon.	Selenographical Colong. of the Sun.	Lat.	Geocentric Libration Sel. Long. of the Earth.	Lat.	Combined Amount.	Direction.
1897.	°	°	°	°	°	°
Feb. 20	132·07	+0·48	−1·10	5·77	5·87	10·7
21	144·22	·50	+0·29	6·47	6·48	357·5
22	156·38	·53	1·60	6·77	6·95	346·8
23	168·54	·56	2·76	6·64	7·18	337·5
24	180·70	+0·58	+3·72	+6·10	7·14	328·8
Mar. 6	302·68	+0·80	+1·13	−6·10	6·21	190·4
7	314·88	0·83	−0·06	6·55	6·55	179·5
8	327·08	0·85	1·32	6·71	6·84	168·9
9	339·27	0·87	2·60	6·58	7·08	158·5
10	351·45	0·89	3·85	6·17	7·27	148·1
11	3·63	+0·92	−5·01	−5·49	7·42	137·7
12	15·81	0·94	5·96	4·54	7·49	127·4
13	27·98	0·97	6·66	3·36	7·46	116·9
14	40·15	0·99	7·02	1·99	7·29	105·8
15	52·31	1·01	6·98	−0·46	7·00	93·8
16	64·47	+1·04	−6·50	+1·14	6·60	80·1
17	76·62	1·06	5·57	2·71	6·19	64·0
18	88·77	1·09	4·24	4·16	5·93	45·5
19	100·92	1·11	2·58	5·35	5·94	25·6
20	113·07	1·13	−0·76	6·19	6·24	6·9
21	125·22	+1·15	+1·10	+6·61	6·70	350·6
22	137·38	1·17	2·80	6·58	6·14	337·0
23	149·55	1·19	4·25	6·11	7·44	325·4
24	161·72	1·20	5·34	5·28	7·50	314·8
25	173·90	+1·21	+6·04	+3·86	7·33	304·6
Apr. 5	308·23	+1·35	−1·79	−6·48	6·72	164·6
6	320·44	1·37	3·09	6·12	6·85	153·3
7	332·65	1·38	4·35	5·49	7·01	141·7
8	344·86	1·39	5·53	4·62	7·20	130·0
9	357·06	1·40	6·55	3·52	7·43	118·3
10	9·25	1·42	7·33	2·24	7·66	107·0
11	21·44	+1·43	−7·79	−0·81	7·83	96·0
12	33·63	1·44	7·84	+0·70	7·87	84·9
13	45·81	1·45	7·42	2·23	7·74	73·2
14	57·98	1·46	6·50	3·67	7·46	60·4
15	70·15	1·47	5·09	4·92	7·07	45·8

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Greenwich Noon.	Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Geocentric Libration Direction.
1897.	°	°	°	°	°	°
Apr. 16	82·32	+1·48	−3·27	+5·87	6·71	29·0
17	94·48	1·49	−1·18	6·42	6·53	10·4
18	106·65	1·50	+0·98	6·52	6·59	351·5
19	118·82	1·50	3·02	6·15	6·85	333·9
20	130·99	1·51	4·76	5·38	7·18	318·6
21	143·17	1·51	6·08	4·27	7·42	305·1
22	155·36	1·51	6·93	2·93	7·52	293·0
23	167·55	+1·51	+7·32	+1·46	7·46	281·3
May 5	314·25	+1·51	−4·38	−4·63	6·32	136·3
6	326·48	1·51	5·52	3·56	6·56	122·9
7	338·71	1·51	6·52	2·32	6·92	109·6
8	350·93	1·51	7·30	−0·94	7·36	97·3
9	3·14	1·51	7·80	+0·52	7·82	86·2
10	15·35	1·51	−8·04	1·99	8·28	76·0
11	27·55	1·50	7·63	3·40	8·35	65·9
12	39·74	1·50	6·83	4·65	8·26	55·6
13	51·93	1·50	5·54	5·66	7·92	44·3
14	64·12	1·49	3·81	6·31	7·37	31·0
15	76·30	+1·48	−1·77	+6·54	6·78	15·0
16	88·48	1·48	+0·42	6·31	6·32	356·2
17	100·66	1·47	2·55	5·63	6·18	335·7
18	112·84	1·46	4·43	4·56	6·36	315·9
19	125·02	1·45	5·92	3·21	6·73	298·5
20	137·21	1·43	6·93	1·70	7·13	283·8
21	149·41	1·42	7·45	+0·14	7·45	271·0
22	161·62	1·41	7·50	−1·38	7·62	259·5
23	173·83	1·40	7·15	2·79	7·67	248·6
24	186·04	+1·38	+6·48	−4·02	7·62	238·1
June 4	320·68	+1·25	−6·01	−1·04	6·10	99·8
5	332·92	1·23	6·68	+0·42	6·85	86·4
6	345·15	1·22	7·07	1·88	7·49	75·1
7	357·37	1·21	7·19	3·28	7·90	65·4
8	9·59	1·19	6·91	4·54	8·26	56·5
9	21·80	1·18	6·24	5·58	8·36	48·1
10	34·01	1·16	5·14	6·30	8·12	39·0
11	46·21	1·14	3·65	6·64	7·57	28·7

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Greenwich Noon.		Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Geocentric Libration Direction.
1897.							
June	12	58°·41	+1°·12	−1°·90	−6°·54	6°·81	16°·1
	13	70·60	1·10	+0·07	5·99	5·99	359·3
	14	82·79	1·08	2·01	5·02	5·41	338·3
	15	94·98	1·06	3·77	3·72	5·30	314·6
	16	107·17	1·04	5·23	2·19	5·66	292·8
	17	119·36	1·01	6·27	+0·56	6·30	275·1
	18	131·56	0·99	6·87	−1·05	6·95	261·3
	19	143·76	0·97	7·02	2·56	7·47	249·9
	20	155·97	0·94	6·77	3·89	7·80	240·0
	21	168·18	0·92	6·17	4·99	7·93	230·9
	22	180·40	+0·90	+5·30	−5·83	7·87	222·1
July	6	351·80	+0·60	−5·46	+5·52	7·76	44·6
	7	4·02	0·58	4·78	6·30	7·90	37·0
	8	16·24	0·55	3·80	6·71	7·71	29·4
	9	28·45	0·53	2·56	6·72	7·19	20·8
	10	40·66	0·50	−1·13	+6·31	6·41	10·1
	11	52·86	0·47	+0·41	5·47	5·49	355·7
	12	65·05	+0·45	1·94	4·28	4·70	335·6
	13	77·24	0·42	3·36	2·81	4·38	310·0
	14	89·43	0·39	4·55	+1·18	4·70	284·6
	15	101·62	0·36	5·44	−0·49	5·46	264·9
	16	113·82	0·33	5·97	2·09	6·32	250·7
	17	126·01	0·30	6·03	3·53	6·98	239·6
	18	138·21	+0·27	+5·92	4·74	7·58	231·2
	19	150·42	0·24	5·38	5·69	7·83	223·3
	20	162·63	0·21	4·57	−6·36	7·82	215·6
	21	174·85	0·18	3·53	6·72	7·59	207·6
	22	187·07	0·16	2·35	6·77	7·17	199·1
	23	199·30	0·13	+1·09	6·66	6·75	189·3
	24	211·53	0·10	−0·18	6·06	6·06	178·3
	25	223·77	+0·08	−1·40	−5·29	5·47	165·2
Aug.	5	358·43	−0·18	−1·80	+6·79	7·02	14·8
	6	10·64	0·21	−0·74	6·47	6·51	6·5
	7	22·85	0·24	+0·43	5·75	5·76	355·7
	8	35·05	0·27	1·55	4·67	4·92	341·7
	9	47·25	0·30	2·63	3·31	4·23	321·6
	10	59·44	0·33	3·58	1·76	3·99	296·2
	11	71·63	0·36	4·36	+0·11	4·36	271·5

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Greenwich Noon.	Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Combined Amount.	Direction.
1897.	°	°	°	°	°	°
Aug. 12	83·81	−0·39	+4·91	−1·51	5·14	252·9
13	96·00	0·42	5·21	3·02	6·02	239·9
14	108·18	0·45	5·23	4·33	6·78	230·3
15	120·37	0·48	4·96	5·38	7·31	222·6
16	132·56	0·50	4·41	6·15	7·56	215·5
17	144·76	0·53	3·60	6·61	7·52	208·4
18	156·96	0·56	2·58	−6·77	7·24	200·8
19	169·16	0·58	1·41	6·63	6·78	191·9
20	181·37	0·61	+0·15	6·20	6·21	181·3
21	193·59	0·63	−1·13	5·51	5·63	168·4
22	218·82	0·65	2·35	4·58	5·14	152·9
23	230·05	0·67	3·44	3·43	4·85	135·0
24	242·29	−0·69	−4·30	−2·10	4·78	116·1

In the general list of published and properly timed lunar photographs and sketches, referred to in the last ephemeris, *Monthly Notices*, vol. lvi. p. 159, the photographs will be arranged according to the Sun's selenographical positions, and the topocentric librations or the selenographical positions of the places of observing will be added, so that the varying effects of the foreshortening may be duly taken into account. For the present I must content myself with making an addition to the old list published in vol. li.

The photographs now inserted are those published in vol. xxxii. part 1 of the Annals of the Harvard College Observatory, those in vol. iii. of the Publications of the Lick Observatory, and the few in *Knowledge*, of which the times are known. The Lick references are :

	Sel. Long. of the Sun.	Lat. of the Sun.		Pacific Standard T. h m s	
Lick 1	15″72	+1°15	1891 July 14	8 12 26·5	Lick, vol. iii.
2	33·98	+0·97	1891 Oct. 12	7 30 54·5	„
3	115·43	+1·51	1890 Aug. 31	14 27	„
4	172·48	−0·91	1895 Oct. 9	16 36 20	Knowl. 95 Oct. Dec.
5	173·00	−0·35	1892 Nov. 10	15 52 41	Lick, vol. iii.
6	184·77	−0·93	1895 Oct. 10	16 49 13·8	Plate 1 of Obs. Atlas.
7	190·10	+1·37	1891 July 28	15 49 16	Lick, vol. iii.

The time of the Paris photograph in *Knowledge* for '95 June and '96 April should be 1894 March 14, $7^{h}\ 4^{m}{\cdot}5$ Paris mean time, as M. Puiseux has kindly informed me, the inserted time being approximately sidereal. The sketches referred to in the list are found in the reports of the Lunar Section of the British Astronomical Association, or in the *Observatory* of 1896.

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Sun's Colong. °		Sun's Colong. °	Lat. °	Spot.				Gr. M.T. h	m	
332·50 + 0·560 ×	⊙'s Lat.	331·86	− 1·14	Piccolomini	1892	Jan.	4	5	15	Elger.
337·15 + 0·201	,,	337·17	+ 0·07	Theophilus	93	Apr.	21	8	42·5	Gordon.
338·28 + 0·201	,,	338·48	+ 1·00	Theophilus	94	May	10	8	15	Mee.
355·13 − 0·258	,,	354·79	+ 1·34	Manilius	96	Jan.	17	9	30	Elger. Obs. p. 302.
2·48 − 0·304	,,	2·62	− 0·46	Plinius	94	Mar.	14	Paris		Knowl. 1895 June.
2·71 + 0·202	,,	,,	,,	Albategnius		,,		,,		,, 1896 April.
3·07 + 0·986	,,	,,	,,	Maurolycus		,,		,,		,, ,,
3·17 + 1·200	,,	,,	,,	Cuvier		,,		,,		,, 1895 June.
7·75 + 0·390	,,	8·09	+ 0·88	Thebit	90	May	24	9	10	Corder.
11·39 + 0·330	,,	11·80	+ 1·23	Arzachel	88	Sept.	13	16	2	Harvard, vi. 5.
11·51 + 0·233	,,	,,	,,	Alphonsus		,,		,,		,, vi. 5.
13·39 − 0·409	,,	12·77	+ 1·53	Conon	89	Oct.	2	15	19	,, vi. 1.
13·58 − 0·529	,,	,,	,,	Archimedes		...		...		,, vi. 1.
16·02 − 0·258	,,	15·72	+ 1·15	Eratosthenes	91	July	14	...		Lick 1.
16·19 − 0·415	,,	...		Conon		—		—		—
16·30 − 0·594	,,	...		Timocharis		—		—		—
16·30 − 0·533	,,	...		Archimedes		—		—		—
16·52 − 0·701	,,	...		Aristillus		—		—		—
16·76 − 0·910	,,	15·72	+ 1·15	Cassini	91	July	14	...		Lick, 1.
23·33 + 0·350	,,	23·77	+ 1·24	Arzachel	88	Sept.	14	15	36	Harvard, vi. 6.
23·46 + 0·246	,,	,,		Alphonsus		,,		,,		,, ,,
32·70 − 0·057	,,	32·62	+ 1·37	Reinhold	89	Sept.	4	18	6	,, v.
32·85 − 0·169	,,	,,		Copernicus		,,		,,		,, ,,
34·14 − 0·170	,,	33·98	+ 0·97	Copernicus	91	Oct.	12	(frontispiece)		Lick, 2.
37·65 − 0·429	,,	37·30	+ 0·81	Euler	96	Mar.	24	9	45	Elger. Obs. p. 440.
49·28 − 0·203	,,	49·11	+ 0·84	Marius	96	Mar.	25	9	2·5	Elger. Obs. p. 329.
52·03 − 0·432	,,	52·53	− 1·15	Aristarchus	94	Nov.	9	8	37·5	Sheldon.
64·41 + 0·093	,,	64·49	+ 0·90	Damoiseau	87	Dec.	27	8	30	Elger. Obs. p. 399.
103·35 + 1·632	,,	105·69	+ 1·45	Endymion	89	Sept.	10	18	8	Harvard, vi. 3.
103·80 + 1·329	,,	,,		Hercules		,,		,,		,, ,,
113·09 − 0·463	,,	113·67	− 1·25	Petavius	94	Nov.	14	9	30	Sheldon.
113·57 − 0·354	,,	113·85	− 0·80	Vendelinus	91	Dec.	17	9	15	Elger.
114·42 + 0·674	,,	115·43	+ 1·51	Geminus	90	Aug.	31	...		Lick, 3.
114·66 + 0·515	,,	...		Cleomedes		—		—		—
115·03 + 0·265	,,	...		Prom. Agarum		—		—		—

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Sun's Colong. c	⊙'s	Sun's Colong. °	Lat. °	Spot.	Gr. M.T.	h	m	
115·65 − 0·148	,,	...		Langrenus	—	—		—
115·72 − 0·187	,,	...		Goclenius	—	—		—
115·96 − 0·353	,,	...		Vendelinus	—	—		—
116·13 − 0·460	,,	...		Petavius	—	—		—
116·42 − 0·655	,,	115·43	+ 1·51	Furnerius	90 Aug. 31	...		Lick, 3.
117·51 − 0·353	,,	117·58	− 0·21	Vendelinus	92 Nov. 6	10	30	Elger.
123·77 + 1·511	,,	123·94	+ 0·11	Endymion	88 July 25	21	52	Harvard, vi. 4.
123·82 + 1·102	,,	,,		Hercules	,,	,,		,, ,,
126·87 − 0·035	,,	126·82	− 1·27	Messier	94 Nov. 15	11	30	Mee.
138·53 − 0·569	,,	139·01	− 0·85	Piccolomini	94 Dec. 19	11	0	Elger.
144·39 − 0·552	,,	144·20	+ 0·34	Piccolomini	93 Sept. 29*	10	30	Davis.
169·91 − 2·839	,,	172·48	− 0·91	Moretus	95 Oct. 9	Lick 4		Knowl. 1896 Oct.
170·54 − 2·140	,,	...		Scheiner	...	...		,, ,,
170·94 − 1·700	,,	...		Clavius	...	...		,, ,,
171·36 − 1·236	,,	...		Maginus	...	...		,, Oct., De
171·45 − 1·411	,,	...		Wilhelm I.	...	...		,, ,, ,,
171·58 − 0·990	,,	...		Tycho	...	...		,, ,, ,,
171·89 − 0·651	,,	...		Hell	...	...		,, ,,
171·92 − 0·616	,,	172·48	− 0·91	Walter	95 Oct. 9	...		,, ,,
172·66 − 0·983	,,	173·00	− 0·35	Tycho	92 Nov. 10	...		Lick 5.
180·05 − 5·12	,,	184·77	− 0·93	Newton	95 Oct. 9	...		Lick 6.
182·24 − 2·722	,,	...		Moretus	—	—		—
183·84 − 2·083	,,	...		Blancanus	—	—		—
183·03 − 1·886	,,	...		Scheiner	—	—		—
183·30 − 1·588	,,	...		Clavius	—	—		—
183·46 − 1·413	,,	...		Longomontanus	—	—		—
183·66 − 1·192	,,	...		Maginus	—	—		—
183·90 − 0·937	,,	...		Tycho	—	—		—
184·10 − 0·789	,,	...		Capuanus	—	—		—
184·13 − 0·687	,,	...		Cichus	—	—		—
184·19 − 0·626	,,	...		Hell	—	—		—
184·24 − 0·571	,,	184·77	− 0·93	Pitatus	95 Oct. 9	...		Lick 6.
190·19 + 0·167	,,	190·42	+ 1·37	Copernicus	91 July 28	...		Lick 7.
217·81 + 0·437	,,	218·48	+ 1·50	Aristarchus	89 Sept. 20	0	9	Harvard vi. 2.

* The right date is Sept. 29, not Sept. 3.

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In order to ascertain the time when for a spot on the list the Sun is at the same zenith distance as at the time assigned to the photograph or sketch, it is only required to multiply the Sun's selenographical latitude (taken from the ephemeris for the approximate time of the occurrence) by the factor given in the second column of the list, to add the product to the Sun's colongitude (for latiude 0°) in the first column, and to determine, by reference to the ephemeris, the time when the Sun reaches the colongitude thus found. Though the Sun's zenith distance will then be the same as at the time of the photograph or sketch, the effects of the illumination may yet differ sensibly, as they depend also on the Sun's azimuth, and they will therefore only agree if the Sun's latitude is the same on both occasions.

As the daily rate of increase of the Sun's colongitude is between 12°·12 and 12°·25, the ephemeris is sufficiently accurate for finding the time to about a minute. But the time thus found is merely that corresponding to the assigned time of the photograph or sketch, and any error or vagueness of the assigned time is simply reproduced. If the evidence of the sketches is to be used for determining the proper times for measuring the shadows, it is clearly essential that the correct times should be stated when the outlines of the shadows have actually been drawn.

The following are the times of recurrences for a few of the spots in the preceding list, to which is added *Plato* as sketched by M. Elger, 1887 February 1, inserted in the old list of 1891, and also referred to in vol. xlviii. p. 294.

	1897.		h	m			h	m			h	m			h	m
Piccolomini	Jan.	8	5	30	Feb.	6	20	53	Mar.	8	11	37	Apr.	7	1	13
Theophilus		8	15	12		7	6	0		8	20	10		7	9	24
Manilius		10	3	19		8	17	12		10	6	48		8	19	30
Plinius		10	17	53		9	7	49		10	21	11		9	9	49
Albategnius		10	17	40		9	8	25		10	22	33		9	11	41
Maurolycus		10	17	21		9	9	22		11	0	41		9	14	34
Cuvier		10	17	16		9	9	39		11	1	14		9	15	21
Thebit		11	3	21		9	18	25		11	8	50		9	22	8
Plato		11	13	36		10	2	4		11	14	4		10	1	50
Eratosthenes		11	20	33		10	10	31		11	23	56		10	12	36
Timocharis		11	21	24		10	11	0		12	0	2		10	12	28
Aristillus		11	22	5		10	11	20		12	0	6		10	12	19

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	1897.		h	m			h	m			h	m			h	m
Piccolomini	May	6	13	28	June	4	22	34	July		...		Aug.		...	
Theophilus		6	21	32		5	8	47			...				...	
Manilius		8	7	29		6	19	0		6	6	15		4	17	36
Plinius		8	21	48		7	9	19		6	20	38		5	8	5
Albategnius		8	23	45		7	10	58		6	21	40		5	8	20
Maurolycus		9	2	47		7	13	31		6	23	15		5	8	45
Cuvier		9	3	37		7	14	10		6	23	43		5	8	52
Thebit		9	10	13		7	21	18		7	7	46		5	18	10
Plato		9	13	37		8	1	42		7	14	7		6	2	58
Eratosthenes		10	0	33		8	12	2		7	23	18		6	10	42
Timocharis		10	0	22		8	12	0		7	23	34		6	11	21
Aristillus		10	0	13		8	11	58		7	23	48		6	11	52

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